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Climatic and Human Factors Associated With the Production of Selected Vegetable Crops in an Area of Louisiana.

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CLIMATIC AND HUMAN FACTORS ASSOCIATED WITH THE PRODUCTION OF SELECTED VEGETABLE CROPS IN AN AREA OF LOUISIANA

A Dissertation

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DEDICATION

To Lila, my wife, for her help and understanding.

To all my children

To the late Anita Posas Borjas and P. Quiroz, my parents, because earlier efforts will never be forgotten. To Mr. Manuel Posas, my uncle.

To the Ministry of Natural Resources and the farmers of my country.

To Educredito. To the E. A. P. Zamorano, Honduras.

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TABLE OF CONTENTS

CHAPTER		Page
	Acknowledgement	ii
	Dedication	iii
	List of Figures	vi
	List of Tables	vii
	List of Appendices	ix
	Abstract	x
I.	INTRODUCTION	1
	The Problem	2
II.	REVIEW OF LITERATURE	4
	Critical Temperatures of Vegetable Crops	7
	People and the Adoption Process	11
	Adoption, Tenure Status, and Nature of the Practice Itself	14
III.	RESEARCH DESIGN	16
	Objectives of the Study	16
	Data Sources	16
	Method of Procuring Data	17
	Data Analysis	18
IV.	CLIMATIC REQUIREMENTS OF HORTICULTURAL CROPS	20
	Climatic History	20
	A Comparison and Discussion of Weather Data and the Characteristics and Requirements of Crops	22
	Climatic Requirements of Specific Crops	28
V.	HUMAN FACTORS ASSOCIATED WITH HORTICULTURAL CROP PRODUCTION	35
	Personal Characteristics of Farmers	35
	The Crops and Varieties Planted	38
	Selected Vegetable Production Practices	43
	Sources of Information	43
	The Respondents' Willingness to Plant a New Crop	49
	Correlation Between Variables	55

CHAPTER	Page
VI. SUMMARY AND CONCLUSIONS	60
Summary	60
Conclusions	62
BIBLIOGRAPHY	66
APPENDICES	69
Appendix A	70
Appendix B	78
Appendix C	94
VITA	97

LIST OF FIGURES

FIGURE		Page
1.	Temperatures in the Baton Rouge Area, 1948-1973	23
2.	Precipitation in the Baton Rouge Area, 1948-1973	27
3.	The Vegetable Production Area Tangipahoa Parish, 1977-78	41

LIST OF TABLES

TABLE		Page
1.	Climatic Requirements of Vegetable Crops	29
2.	Age of the Respondents, Tangipahoa Parish	36
3.	Educational Status of the Respondents, Tangipahoa Parish, 1977-1978	36
4.	Farm Tenure of the Respondents, Tangipahoa Parish, 1977-1978	37
5.	The Opinions of the Respondents as to the Most Important Problems in Producing Vegetable Crops, Tangipahoa Parish, 1977-1978	38
6.	The Crops Planted by the Respondents on their Farms, Tangipahoa Parish, 1977-1978	39
7.	Crop Varieties Planted by the Respondents, Tangipahoa Parish, 1977-1978	42
8.	A Comparison with Selected Vegetable Production Practices by Number of Farmers and Average Cultivated Acreage by Practice Adoption	44
9.	A Comparison with Selected Vegetable Production Practices by Number of Farmers and Mean Educational Levels by Practice Adoption	45
10.	A Comparison with Selected Vegetable Production Practices by Number of Farmers and Mean Age by Practice Adoption	46
11.	A Comparison of Mean Age to Radio Listening as a Source of Weather Information	47
12.	A Comparison of Mean Educational Level to Radio Listening as a Source of Weather Information	48

TABLE | Page

13. A Comparison of Mean Cultivated Acreage to Radio Listening as a Source of Weather Information 50

14. A Comparison of Mean Cultivated Acreage to Farmers' Opinions Regarding Weather Information Reliability 51

15. A Comparison of Mean Educational Level to Farmers' Opinions Regarding Weather Information Reliability 52

16. A Comparison of Mean Age to Farmers' Opinions Regarding Weather Information Reliability 53

17. A Comparison Between Number of Farmers and Mean Cultivated Acreage to their Willingness to Plant a New Crop 54

18. A Comparison Between Number of Farmers and Mean Educational Level to their Willingness to Plant a New Crop 56

19. A Comparison Between Number of Farmers and Mean Age of Farmers' Willingness to Plant a New Crop 57

20. Relationships Between Years of Farming, Cultivated Acreage, Education, and Age of Vegetable Farmers by Means of Correlation 58

LIST OF APPENDICES

APPENDIX	Page
A. The Interview Schedule	70
B. Maximum and Minimum Temperatures by Day and by Week, Baton Rouge, Louisiana, 1948-1973	78
C. Maximum and Minimum Precipitation Rates by Weeks, Baton Rouge, Louisiana 1948-1973	94

ABSTRACT

This study had as its purpose the following:

1. Developing a model for evaluating horticultural crops for suitability to a particular location.
2. Testing the model under Southeast Louisiana conditions by screening through the model selected horticultural crops.
3. Establishing associations between the personal characteristics of the farmers and farmers' attitudes and opinions.

The elements for the presentation of the model consisted of regional-historical weather data, vegetable crop characteristics and the climatic requirements of the horticultural crops involved. The methodology for the collection of data consisted of weather data from the U.S. Weather Bureau, analyzing research reports on horticultural crops and the use of an interview schedule in collecting the field data from fifty vegetable growers of the Tangipahoa Parish.

In testing the model, a total of 24 horticultural crops were screened for adaptability. The model presented was found useful in testing all possible horticultural crops by screening them through the model. The result was a list of traditional and non-traditional crops recommended for the prevailing conditions of

Southeast Louisiana. Thus, the model was useful in reducing the number of future field experiments, potentially.

Some relationships between personal characteristics of farmers and farmers' attitudes and farming practices were found to be statistically significant at the 0.25 level of probability. A statistically significant negative correlation was found between cultivated acreage and age and a positive correlation was found to exist between years of farming and cultivated acreage. The association between average cultivated acreage and "hot beds" as a farm practice was found to be statistically significant. Those farmers who used the practice tended to have larger acreages of cultivated land. The relationship between the other five farm practices and the mean cultivated acreage was found to be not significant at the 0.25 level of probability. The six farm practices were: mulching, drainage, irrigation, plant protectors, resistant varieties and hot beds. In addition, when these 6 farm practices were compared with the number of respondents and their mean educational level, statistically significant relationships were not found. The same is true when the same six practices were compared with mean age. The findings in relation to the human factors, when compared with the generalizations present in the literature, indicate that problems in the use of the model could be expected. For example, the average age of the farmers in the study was 55.7 years. The literature on the adoption process suggests that age is negatively associated with adoption behavior. In this connection, the model suggests that the change from one variety to another does not present a difficult problem but the introduction of new crops might be more difficult. Most crops planted by the farmers are those for which there are good markets. The introduction of new crops suggested may present, at the beginning, a problem of their acceptance as food for the general consumer. However, the consumer population of latin descent residing in urban areas of the South with experience on eating exotic foods, might well facilitate the introduction of these new crops into the market.

CHAPTER I

INTRODUCTION

It is generally accepted that man can do very little to change the weather, but he has done a great deal to adapt his agriculture to the weather conditions of his environment. Most Louisiana farmers, and other farmers elsewhere, know by experience through trial and error with traditional crops that optimal planting and harvesting dates do exist for their own benefit. In addition, the group of plants, loosely called vegetable crops, contains many species that are now being profitably grown in regions having weather very different from that of their native habitats.

Despite the fact that the native range of some vegetable crops appears to be narrow and the climatic requirements specific, the cultivation of these crops may extend over different latitudes and altitudes because of the relative ease with which seed can be produced and the possibility of bringing short season crops into harvest if the proper varieties have been selected.

Nield and Young (16) found in their work that time of planting and harvesting were related with climate. Furthermore, they found that agro-climate analysis is fundamental to detect potential areas of production. Went and Cooper (23) comment in their study how important it is to know how plants respond to their environment to facilitate the selection of the best areas for selected varieties by simply consulting meteorological information when field trials are lacking.

THE PROBLEM

If ample resources are not available in vegetable farming, those resources at hand must be wisely used so as to offer the vegetable producer a safer combination of crops to increase his total income in order to provide life satisfaction for him and his family. Due to the problems of labor shortage, lack of management, cost of land, and cost of energy, it is not proper to increase the acreage of vegetable crops, but to intensify cropping systems based upon those best alternatives determined by human and climatic factors. This first sub-problem was to reconstruct a record of temperatures and rainfall information of the Baton Rouge area during a twenty-five year period, representative of a typical year of expected conditions in the area of study in order to determine the most convenient crop combinations according to planting and harvesting dates.

The second sub-problem was to prepare a chart of vegetable climatic requirements as a guideline for further comparisons with the climatic conditions of the area of study.

The third sub-problem was to know more about the beliefs, attitudes and values of farmers dedicated to the production of vegetable crops in an area of Louisiana. The relatedness of these sub-problems will be presented in graphic and discussion type forms in subsequent sections of this dissertation.

CHAPTER II

REVIEW OF LITERATURE

The growth rate of vegetable crops is affected by factors such as temperature, thermoperiodicity, daylight, humidity, soil fertility, etc. Of all these factors the most important is the temperature during the growing season. Growers generally realize the nature of this temperature relationship but do not appreciate all the advantages derived by a more specific application of the temperature factor in scheduling the planting of their crops and forecasting the time when each planting will be at the desired stage of maturity for harvesting for optimum quality. Sayre (18) and his work demonstrates the statements shown above. Knott (2) states that temperature and rainfall together with relative humidity determine the safest planting dates of vegetable crops as well as the time and duration of harvest periods. In an attempt to measure the quantitative factor of temperature and correlate this with plant growth, Livingston and Livingston (15) made a study of climatic factors influencing plant growth. They concluded in their study that temperature is one of the most important of conditions governing the natural distribution of plants and animals.

Agriculture may be defined as the art of converting the energy of the sun into fuel for consumption by the human body. As an art, man has to make a good use of climate in order to fulfill his needs for food. Hajek, et al. (7) refer in their studies to the fact that, among the climatic variables, temperature plays a major role. They determined vegetable periods based on the method of heat accumulation. Different base temperatures were simulated (from 0^{o} to $15^{o}C$) to establish the length of the vegetative periods along a latitudinal gradient going from 18 to 53 degrees south in Chile, S. A.

Studies on the effect of climate on crops have taken varied and different forms of approaches. Detailed recording of a vegetable characteristic such as earliness or yield, and describing its relationship with one, two or more climatic factors by means of statistical procedures has been a common practice (9).

Parker (17) and Went (22) on the other hand, describe the utilization of a growth chamber where most environmental factors can be controlled within narrow limits. In this manner, every independent factor is studied separately. It is necessary in an experiment of such kind to repeat it as many times as there are factors involved. The problem with information gained from controlled environments is that it will be artificial to a certain degree; thus, general validity in the use of the results may be questioned. Results from climate chambers, therefore, should be field tested before being released as recommendations. Some writers indicate that vegetative growth does not proceed in direct proportion to unit increases in temperature. For each degree rise in temperature there is somewhat more than a unit increase in growth. The relationship has been demonstrated by Leicht (14) for a cool season crop and by Lehenbauer (13) at a lower temperature than that of corn which has been taken to represent the warm season crop.

It follows that the optimum growth rate of peas is reached at a lower temperature than it is for corn. Other than these differences, there is a very close resemblance in growth-rate responses to temperature between the two crops. Exponential and remainder systems have been used in practice with a fair degree of accuracy and success in predicting the time required for various vegetable crops to reach maturity (Katz, 11). This is not surprising in view of the growth curve similarity normally experienced by plants of the same group in the same region or environment. In both systems, temperature efficiency indices are computed from the mean daily temperatures throughout the growing seasons. In addition, all of the existing heat-unit formulae are derived on the premise that a linear relationship exists between the amount of growth and the mean daily temperature. On the other hand, Lehenbauer (13) in 1914 made it clear that the initial rate of growth was not maintained after prolonged exposure of plants to high temperatures. Braud and Hawthorne (5) in their study on sprinkling to prevent cold damage of strawberries imply that Baton Rouge climatic data is similar to that occurring in the Livingston and Tangipahoa areas where strawberries and other crops are produced commercially. In this study, the determination and selection of planting and harvesting dates of crops in view of climatological data is an attempt to develop a model to be used in reducing the number of field experiments for specific crops at a given location. Research workers, conducting field tests, and agricultural extension workers, assigned to new areas of production, may benefit particularly from that kind of agroclimatological studies.

Critical Temperatures of Vegetable Crops

The works of Knott (3) and Sheldrake (19) were consulted in order to present the table contained herein. In some cases varietal differences must be taken into account, as pointed out by both workers. Three critical temperatures were found for the Tendergreen variety of snap beans to be: minimum- 50 degrees F.; optimum- 83 degrees F.; and maximum- 96 degrees F. The problem of a minimum temperature for growth becomes a complicated task because of the various definitions of growth. Increase in dry matter and linear expansion or water absorption are considered processes of growth in plants. The minimum temperature for the growth of Golden Cross sweet corn was reported to be 50 degrees F., the optimum temperature was 80 degrees F., and the highest temperature at which growth of sweet corn occurred was 96 degrees F. A cool season crop, beets, was also included. The minimum temperature for the growth of Detroit Dark Red beets was slightly below 50 degrees F. The optimum temperature was 66 degrees F., and the maximum temperature above which no measurable amount of growth occurred was 94 degrees F.

As discussed above, the first part of the review of literature in this study deals with the growth of vegetable crops and how they are affected by agroclimatological factors such as temperature and precipitation.

The second part of the review of literature, which follows, has to do with those human responses of how farmers react to new crop varieties, new farming practices, and how farmers are influenced toward change.

All this together complements the applied purpose of this study because the science and art of Socio-horticulture is meaningful only when its produce serves, for example, as food for the human machine or as recreation to the human eye.

The writer agrees with Jones (24) who manifests in his work in Tangipahoa Parish that there is a possibility that the underlying desire of the Tangipahoa farmer is to have always the best of plant varieties or animal breeds. It is a predominant factor which prompts the wide acceptance of an improved breed or variety as a common farm practice. Fortunately, continuing research, relatively speaking, rapidly develops new vegetable crop varieties with higher yields.

Jones found in his work (10) that younger age dairy farmers of Tangipahoa Parish were more likely to use artificial breeding, as a new farm practice, than older age groups of dairy farmers. Therefore, his works suggest that efforts in increasing use of the artificial breeding practice may well be concentrated on younger age dairy farmers. He also found that the amount of education of the farmer is a factor related to the extent of usage of new farm practices. In addition, dairy farmers who were in the business for a lesser number of years were more receptive to artificial breeding as a new farm practice. The same was true when he compared large size herd owners with small size herd owners. The latter group was more likely to adopt artificial breeding as a recommended dairy practice.

Research and practical experience have shown (Sociohorticulture Research Team, 25) that in attempting to help people in the solution of their own problems, there is an advantage in working with groups rather than with individuals, due to the fact that farmers or people in general interact with each other in order to reach understanding in social relations. In connection with the above statement, we may say that attitudes of farmers are at the very core of social interaction. It would be impossible to comprehend interaction without first detecting the kind of attitude involved. The attitudes we learn from groups serve as building blocks for individual personality. Getzels, cited in the work of

Lacy (12), states that the significance of an attitude is that it predisposes us to react to present events in terms of past experiences and beliefs. A belief could be defined as an attitude which involves the acceptance of something as being real. It could be the acceptance of a statement, principle or a premise.

D'Armond (6), in a 1962 study, reports that most of the farmers involved in a study of strawberry yields in one area of Louisiana when asked about what variety of strawberries they like best, responded Dabreak. Seventy-eight percent of the farmers responded Dabreak and 17% Headliner. When the yield per acre was considered he found that about the same proportion of farmers in both the higher and lower yield group preferred Dabreak or Headliner. When farmers were asked what they liked about the variety they planted, 77% of them responded that they planted Dabreak because it was an early producing variety with a larger fruit than other varieties planted. Sixteen percent of the farmers at that time liked Headliner because of its large fruit. When these same farmers were asked what they did not like about the variety planted, 32% indicated they did not like the variety because of susceptibility to disease and 6% indicated the variety was a late producing variety.

When each farmer was asked who influenced him to plant the variety he planted, 78% reported their neighbors influenced them; 26% indicated the Agricultural Extension Service influenced them, and 1% listed an association or a selling agency in Livingston

Parish. It is interesting to note that the leading variety in the strawberry production area in 1962 was the Headliner variety which now is being substituted for the Tangi variety, due to higher yields and resistance to plant disease. This variety was formerly called selection L63-377 by Louisiana researchers (Wascom, et al., 1975). It was reported as an excellent variety for commercial processing and home production, and studies indicated that its fruit was equal or superior to other Louisiana varieties. In addition, early and total season yields of Tangi were significantly higher than Dabreak and Headliner varieties.

People and the Adoption Process

As a person is going through the various steps of the adoption process, other persons have a large influence on his decision to make the change. Thompson (20) found that professional agricultural workers ranked first as an information source at the adoption stage of the adoption process. Farmers did not usually adopt new ideas immediately after learning about them. Lionberger (4, pp 22) mentioned in his book that upon learning of a new practice, one goes through a series of stages before a farm practice is adopted. The stages are as follows:

1. Awareness- This is the first stage immediately following the farmer's hearing of a new practice or idea. During this stage he may have no idea whether the idea will work on his farm or not. Lionberger (4) points

out that mass media such as periodicals, radio, television, and magazines, rank first as sources of information. Friends and neighbors rank second.

2. Interest- At this stage, the farmer is motivated, he is interested in the new practice. He is no longer satisfied with only an awareness that the practice exists. He talks to neighbors about it, reads and comments about it, and seeks additional information related to the new practice. All things considered, mass media rank first, and friends and neighbors at this stage, rank second as sources of information. The agricultural agencies usually rank in close third place.

3. Evaluation- Based on information gained in previous stages, the farmer makes a mental evaluation of the practice. Evaluation is the stage where the farmer decides whether the practice may work on his farm or not. Although evaluation is involved in all stages of the adoption process, it is more noticeable at this stage. Friends and neighbors rank first as sources of information and agricultural agencies rank second at this stage.

4. Trial- At this stage, the farmer puts the change into use on his farm. Usually, he tries the practice on

a small scale before attempting to use it on a large scale. He must find out for himself how, where, when, and how much the practice is going to entail. Neighbors and friends, according to this author, rank first as information sources, followed closely by agricultural agencies.

5. Adoption- At this stage the farmer decides that the trial proved satisfactory on his farm or at least that the practice was good enough for full scale utilization. We may say then, he adopts the new practice. Friends and neighbors rank first, and agricultural agencies rank second as sources of information. Lionberger (4) clarifies for the benefit of the reader that those five stages are not separate: "What these stages do represent is a useful way of describing a relatively continuous sequence of action, and influences that intervene between initial knowledge about the idea, product, or practice, and the actual adoption of it." Stages may be blended together, omitted or the idea may be abandoned at any point along the continuum.

Bertrand (1, pp 145), in his discussion on acceptance of innovations says that professional change agents (County Extension Agents, for example), are usually given more credibility than salesmen. However, change agents are more successful if they improve their client's ability to evaluate their innovations rather than only promoting it.

Adoption, Tenure Status, and Nature of the Practice Itself

Lionberger (4) in his discussion of situational factors in diffusion, comments on the well known fact that farm owners have more complete control over farming operations than do tenants. The owners can make as many decisions as they please to adopt new practices, but tenants must consult the owners, in many cases, before trial or use of a new practice can take place. This is especially true when tenants are at a financial disadvantage.

The speed or rate of adoption of a practice is in part dependent upon the nature of the practice itself. A group of rural sociologists has classified practices in relation to their complexity as follows:

1. Change in materials and equipment only, without a change in techniques or operations (e.g., new varieties of seed).
2. Change in existing operations with or without a change in materials or equipment (e.g., change in rotation of crops).
3. Change involving new techniques or operations (e.g., contour cropping).
4. Change in total enterprise (e.g., from crop to livestock farming).

Lionberger (4, pp 103-105) states that the following generalizations seem likely to apply to farm practice adoption rates:

1. Practices involving large capital outlay will be adopted more slowly than those requiring small amounts of capital.
2. The more compatible a practice is with existing farming operations, the more likely it will be adopted quickly.
3. Traits or practices readily communicated by conventional methods used by farmers will be adopted more readily than those that are not.
4. The more difficult it is to retract a decision and the subsequent consequences, the slower adoption is likely to be.
5. Costly and complex practices that can be taken a little at a time will likely be adopted more quickly than where this is not possible.

CHAPTER III

RESEARCH DESIGN

OBJECTIVES OF THE STUDY

1. To develop a model for evaluating horticultural crops for suitability to a particular location.
2. To test out the model under southeast Louisiana conditions, screening through the model vegetable crops by means of the following; 1) regional-historical weather data; 2) vegetable crop characteristics and the climatic requirements of the crops involved; and 3) farmers' attitudes, beliefs, problems and personal characteristics such as age, education, etc.
3. To determine the associations between personal characteristics of farmers and farmers' attitudes, practices and problems.

DATA SOURCES

All data for this study were collected by means of personal interviews and research reports. Field data were obtained by interviews with farmers of Tangipahoa Parish. Fifty farmers, selected at random from a complete list of farmers of the Parish, were interviewed by the writer. The sample was representative of twenty-five percent of the entire population of farmers with two or more vegetable crops. Local Agricultural Extension Agents cooperated in this study by providing the list of farmers and helping in the pre-test of the interview schedule. The research reports of Knott (3), Sheldrake (19), and personal observations provided the guidelines for the climatic requirements of the vegetable crops involved. Weekly figures of the climate of the Baton Rouge area were prepared by using available daily weather information collected by the National Weather Service over a period from 1948-1973.

METHOD OF PROCURING DATA

Research Review

Examples of the influence of climate on vegetable growth, climatic data of the area of study, and climatic requirements of vegetable crops were collected by means of personal interviews, and review of literature. Maximum and minimum temperatures and maximum, minimum and average precipitation were used as the basis for the preparation of a typical year. Weekly average rainfall was considered useful and necessary in order to present its distribution. Optimum, maximum, and minimum temperature and precipitation data were collected as requirements or climate needs of the vegetables involved in the study.

Field Data

The field data were secured by the personal interview method. The writer secured data about the farmers and their opinions, the vegetable crops planted, and how farmers related the influence of climate to vegetable farming.

Personal information was secured at the end of the interviews by asking individual questions of the farmers as to their age, years in farming, land tenure, schooling and numbers of members of the family participating in the farming of vegetable crops. The personal interview method was selected for obtaining the information because there is a greater control over the data collecting process. Letters or mailed questionnaires have been found to be less time consuming and less expensive procedures, but they are probably less efficient in collecting the desired information because of differences in educational level of farmers and different origin or background.

DATA ANALYSIS

Comparisons were made, by visual analysis, of the weather data of Baton Rouge and the climatic requirements of the vegetable crops involved in order to see how they fit within the model.

Upon completion of the interview schedules in the field, the answers were categorized in preparation for coding. Hand coding and computerized coding were used, depending on the complexity of the answers. Answers to open end questions were categorized as to their similarity after all different types of answers were examined carefully and re-recorded. Answers to other kinds of questions were categorized by employing statistical arrays. By employing this method of examination to certain answers such as age of farmers, farming acreage, schooling, etc., one is also better able to determine the number of categories which will be set up for purposes of statistical interpretation. Following categorization, each answer was assigned a code number. According to its number, each answer in all interview schedules was transferred to code sheets for further processing. The remainder of the processing was done at the L.S.U. System Network Computer Center.

The processed data were used to set up frequency distributions and relationships between dependent variables such as age, farming acreage, and schooling, and independent variables such as attitudes on weather service reliability, weather information sources, farming practices, and farmers' willingness to plant new crops. The least squares regression method of determining the significance of the difference between means was employed as statistical instrument. If the null hypothesis was true $m_1 = m_2$ or $m_1 + m_2 = 0$. If the variation was found too great, we reject the hypothesis that $m_1 = m_2$.

CHAPTER IV

CLIMATIC REQUIREMENTS OF HORTICULTURAL CROPS

The analysis of the data collected for this dissertation has been made principally by comparing, first, regional-historical weather data to crop characteristics and climatic requirements, and second, by analyzing personal characteristics, farmers' opinions, vegetable practices, and problems. A discussion follows in this chapter on the first item, to determine what vegetable crops are more suitable for growing under Southeastern Louisiana conditions.

Climatic History

Baton Rouge, Louisiana, is located to the east of the Mississippi River, in the southeastern section of the state, 60 miles inland from the coast. The area is near the first evident relief, north of the deltaic coastal plain, marsh and swamp terrain stretching southward to the Gulf of Mexico. The NOAA National Weather Service office which provides to the citizens daily weather information, made available climatic history information. It is located at Ryan Airport, some eight miles north of the downtown area. Elevations in East Baton Rouge range from 25 feet above sea level, in the southern section, to more than 100 feet in the extreme north. The average elevation is 64 feet.

Rainfall is heavy, with the normal annual total more than 54 inches. Almost all rainfall is of the convective and air mass types--showery and brief--the exception being during the winter when frontal systems become stationary and rain often falls continuously for several days. The winter months are normally mild, with cold spells of short duration. A common pattern is weather turning cold one day, reaching the lowest temperatures after sky clears on the second day, and warming up the third day. The summer months are very warm, but temperatures seldom rise above 100^{o}F.

The National Weather Bureau defines a killing frost as the condition in which the air temperature recorded in the standard shelter is 32^{o}F or lower. Braud and Hawthorne (5) believe that a night with cold temperatures lasting for many hours is more destructive to vegetation than is one with cold lasting for only a few hours. The soil cools more slowly than the air above it. While air temperature may drop rapidly, the soil temperature changes only a few degrees per hour. This lag in soil temperature prevents the ground from freezing overnight under most weather conditions in the Southeastern Louisiana area.

A record of 32 nights of freezing weather in one season is reported by these investigators in a study of a 19-year period in the Baton Rouge area.

A COMPARISON AND DISCUSSION OF WEATHER DATA AND THE CHARACTERISTICS AND REQUIREMENTS OF CROPS

Figure 1 shows, in graphic form, the typical year of the Baton Rouge area. Maximum and minimum temperature patterns indicate that most vegetables can be grown from week 14 (middle April) to week 43 (October) with no danger of frost from injury whatsoever, the limiting factor being minimum temperatures below 32°F present from week 1 (January) to week 13 (early April) and from week 44 (late October) to week 52 (December). Maximum temperatures for the Baton Rouge area are not considered in general a limiting factor because the general climate is humid subtropical and the air movement from the Gulf of Mexico helps to maintain an environment of infrequent temperature extremes along with ample, well distributed rainfall from week 1 to week 52 of the typical year. Maximum precipitation occurs in week 15 (April) and lowest precipitation in week 43 (October). In the other weeks of the year, the rainfall tends to be substantial for vegetable growing. As an average figure, one inch of rain per week all year round

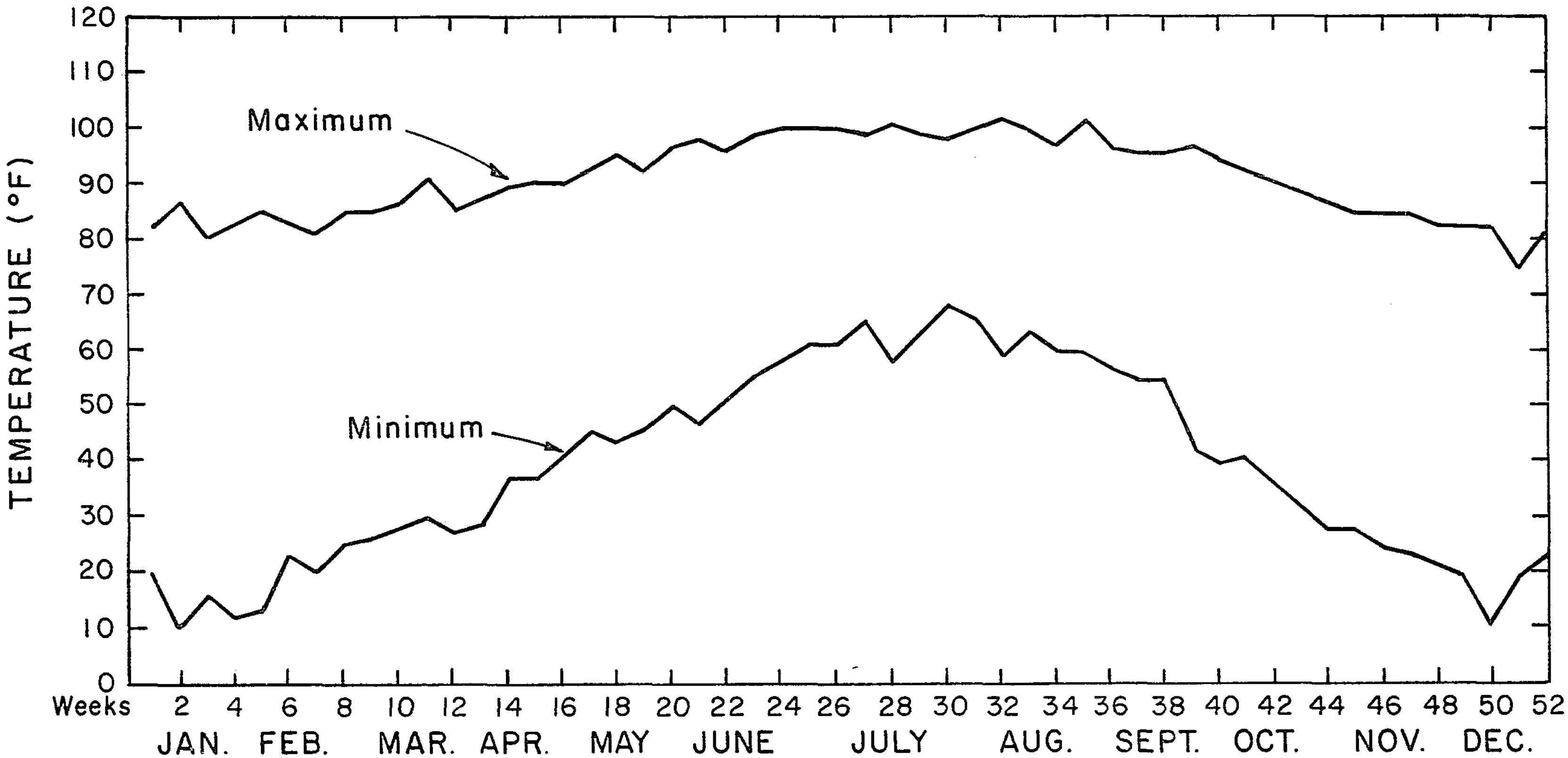

FIGURE 1. TEMPERATURES IN THE BATON ROUGE AREA, 1948-1973

is not uncommon. At week 2 (January) of the typical year, the lowest temperature reading is recorded. Maximum temperatures of 102^{O}F occur at weeks 32 (August) and 35 (August). High temperatures surpassing 100^{O}F are not common because of high humidity and rainfall in the Summer season, making for a condition that allows farming of warm season crops. Table 1 indicates that 95^{O}F is the maximum temperature for growing vegetable crops classified as warm season crops. A persistent warm weather condition, which is not the case for the Baton Rouge area, is detrimental to most cool season crops.

Some very hardy plants, like cabbage and strawberries, can withstand low temperatures occurring within the first 13 weeks of the year, but due to the fact that severe freezes may occur any time in the Spring, a decision has been made to state that after the 14th week, safe dates are available for vegetable growing, until week 43 in October. Beyond October, freezes may occur. Thus, risky plantings are minimized by planting safe. Plants, like strawberries, survive low temperature conditions, assuming that prolonged exposure does not occur. Anyway, the first crop is frequently lost because of low temperature damage to the first blossoms.

Horticultural crops have been classified according to Knott (3) as Cool Season Crops and Warm Season Crops. The crops in table 1 are listed as follows:

Cool Season Crops	Warm Season Crops
Cabbage	Sweet Corn
Onion	Eggplant
Irish Potato	Watermelon
Rhubarb	Tomato
Beet	Peppers
Chinese Cabbage	Sweet Potato
Shallots	Cucumber
Garlic	Snap Bean
Asparagus	Squash
Cauliflower	Okra
Radish	
Carrot	
Strawberry	

Cool season crops are more frost tolerant, their root systems are shallower, the plant size is smaller and most attention must be directed to irrigation. It is common practice to irrigate cool season crops more frequently than warm season crops. In addition, irrigation helps for frost protection of vegetable crops, and avoids wilting of vegetables when dry spells occur.

Under the climatic conditions of the Baton Rouge area, presented in Figure 1, none of the crops listed is limited by extreme climatic variations, if provisions are made to plant the crop of interest within week 14 to week 43 of the typical year. Dates for planting, however, along with dates of harvesting, must be determined because excessive precipitation, for example, may limit farming operations such as proper harvesting time. The days when rain is most likely to occur are in

April (Figure 2) and the days with least amount of rain are in October. Dry spells are not the exception, therefore, irrigation is needed for successful vegetable farming at times.

Low or high temperatures may force the grower to build hot beds or cold frames on his farm if he wants to plant an early crop without risk. Very specific information on critical freeze temperatures for specific vegetable crop varieties is very scanty. The fact is that the freezing point of liquid within the plant varies, depending on the early or late developmental stage of the plant itself, as well as from apparent differences from one variety to another. The suddeness of temperature changes and the length of time a plant remains at the critical level are crucial factors.

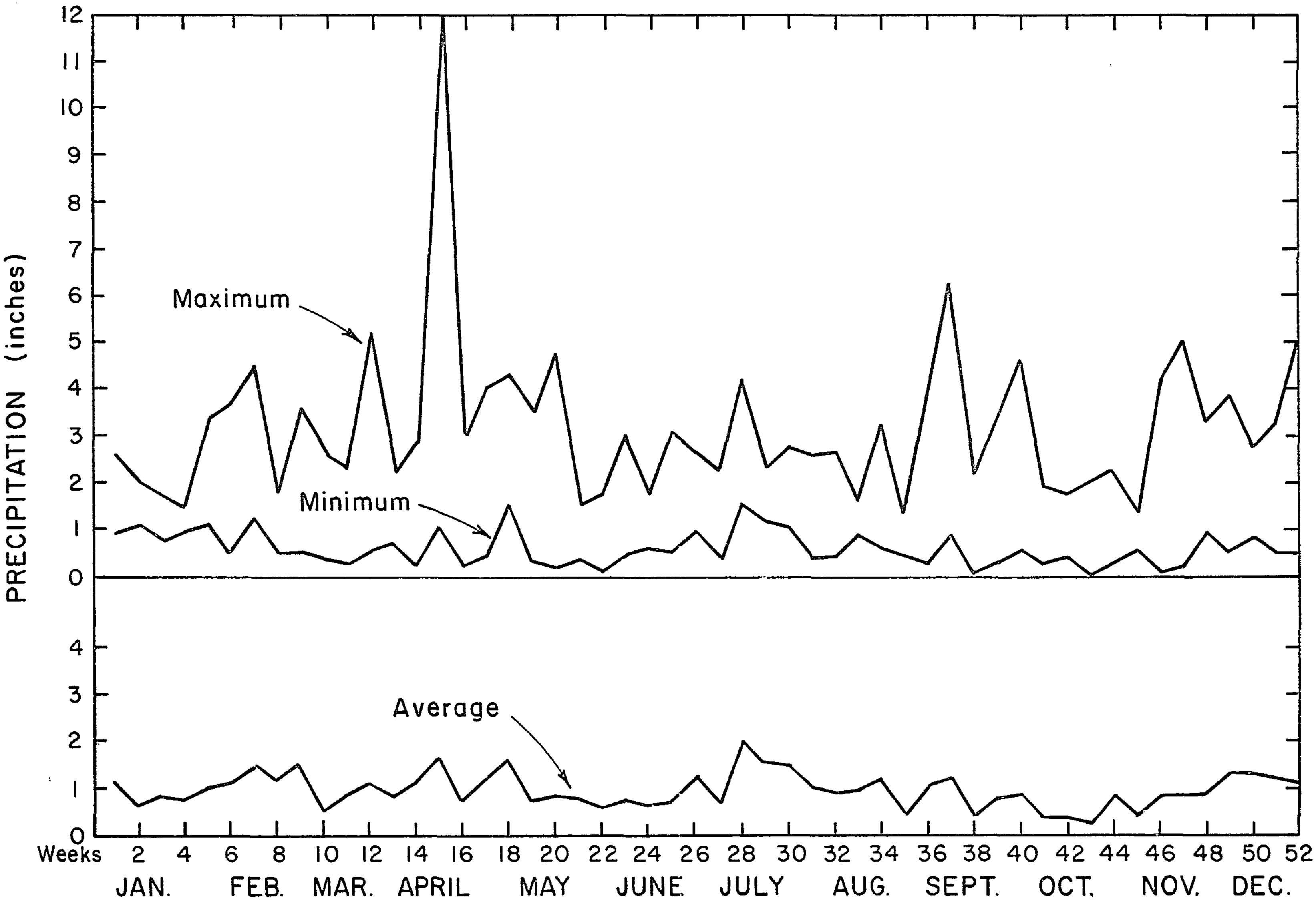

FIGURE 2. PRECIPITATION IN THE BATON ROUGE AREA, 1948-1973

CLIMATIC REQUIREMENTS OF SPECIFIC CROPS

Table 1 presents a list of cool and warm season crops. An evaluation for adaptability of each crop follows:

Cabbage

Cabbage is a cool season crop and very frost tolerant. If farming practices such as good drainage along with proper varietal selection are followed, it can be grown successfully under Southeastern Louisiana conditions. The rating for this crop is 5(See Table 1) for excellent adaptability. Varieties with adequate temperature tolerance must be selected. Some varieties may bolt in the Louisiana winter if they are exposed to 40^{o}F. All the crops listed in Table 1, including cabbage, require an acre-inch of water per week for optimum production. Head splitting may occur when excessive water is applied to full grown heads.

Onion

Due to bolting problems and dates of harvesting and curing, onions are rated 3 = good adaptability. Frequent rainfall can limit intensive production. Further South, Creole onions are very well adapted. Temperature and day length are instrumental in determining varietal limits of adaptation.

Table 1. Climatic Requirements of Vegetable Crops. (After Knott (3) and Sheldrake (19)

Vegetable Crop	Temperature Requirements in ^{o}F Optimum	Maxim	Minim	Frost Tolerance	Water Requirements in Inches Per Week Optimum	Maxim	Minim	Required Days to Maturity	Evaluation
1. CABBAGE	60	77	32	T VH	1	2	.5	65-75	5
2. ONION	70	80	60	T VH	1	2	.5	135-210	3
3. *POTATO (Ir)	63	80	50	T VH	1	2	.5	90-120	3
4. *RHUBARB	65	75	30	T VH	1	2	.5	2 Yrs. ± 600	0
5. *BEET	65	80	40-49	*T H	1	2	.5	55-60	3
6. CH. CABB.	65	70	45	T VH	1	2	.5	60-80	5
7. SHALLOTS	65	85	45	T VH	1	2	.5	50	5
8. GARLIC	75	85	45	T VH	1	2	.5	210	3
9. *ASPAR.	65	80	30	T VH	1	2	.5	2 Yrs. ± Fr. Seed	2
10. CAULFLWR	60	75	45	T VH	1	2	.5	55-65	5
11. RADISH	60	80	40	T H	1	2	.5	22-28	4
12. *CARROT	65	75	45	T H	1	2	.5	70-75	3
13. STR/BERRY	65	90	32	T H +	1	2	.5	1 Year	4
14. SW. CORN	60	80	50	*S	1	2	.5	69-92	3-4
15. EGG PLNT	80	95	65	S	1	2	.5	80-85	5
16. W/MELON	80	95	65	S	1	2	.5	90-100	3
17. TOMATO	75	80	65	S	1	2	.5	60-105	5
18. PEPPER	80	95	65	S	1	2	.5	70-80	5
19. *SW/POT	80	95	65	S	1	2	.5	90-120	3
20. CUCUMBER	75	85	60	S	1	2	.5	50-65	5
21. SNP/BEAN	70-83	80-96	50	S	1	2	.5	48-55	5
22. SQUASH	70	90	50	S	1	2	.5	50-90	5
23. OKRA	80	95	65	S	1	2	.5	60	5
24. CHAYOTE	70	90	50	S	1	2	.5	160	5

T=Tolerant; S=Susceptible; VH=Very Hardy; H=Hardy. *1 Inch= ± 28,000 Gallons on an Acre. 0=Not Adaptable; 1=Poor Adaptability; 2=Fair Adaptability; 3=Good Adaptability; 4=Very Good Adaptability; 5=Excellent Adaptability.

Irish Potato

Irish potatoes, a less hardy cool season crop, may be grown in early Spring or in the Fall. Young plants may be injured by the frost. The rating for this crop of 3 = good adaptability.

Rhubarb

Rhubarb is the hardiest of the cool season crops listed. A biennial plant, it thrives well at temperatures lower than 32°F. Winters, cold enough to freeze the ground, are best for commercial production. The rating for this crop is 0 = not adaptable, because humid summers are highly detrimental to this crop.

Beets

Beets require more cultivation in a climate with frequent rainfall like the Baton Rouge area. This cool season crop is rated 3 = good adaptability.

Chinese Cabbage

Chinese Cabbage is more closely related to mustard than to cabbage. Highly recommended as a winter crop, its rating is 5 = excellent adapatability. The plant demands moist, well drained soils.

Shallots

Shallots are onion-like, but they are mostly used in the green state. Highly recommended, its rating is 5 = excellent adaptability.

Garlic

This crop will endure a wide range of temperatures, but it must be kept dry to prevent sprouting. Garlic is rated like onions: 3 = good adaptability.

Asparagus

The mild winters and high temperatures in the summer time do not favor ample production of spears. This crop is rated 2 = fair adaptability. Low winter temperatures and/or drought give the plant a needed rest period.

Cauliflower

Its rating is the same as cabbage: 5 = excellent adaptability.

Radish

The radish is a cool season crop, and very tolerant to freezing temperatures. During the summer it may develop pithy root-stem tissue. The rating is 4 = very good adapatability.

Carrots

Growth and shape of carrots are influenced by temperature. At $65^{\circ}F$ the type of growth is more normal than at $80^{\circ}F$. Poor color of carrots is a problem at high temperatures. The rating is 3 = good adaptability.

Strawberries

The leaves of the strawberry plant can endure very low temperatures (below $32^{\circ}F$). Air temperatures of $32^{\circ}F$, however, damage green fruits and exposed blossoms. Ongoing research at Louisiana State University is developing varieties where blossoms are not exposed. The rating for strawberries is 4 = very good adaptability.

Sweet Corn

Midsummer weather is hot enough to reduce pollination of sweet corn in Southeastern Louisiana. Low temperatures above freezing, if prolonged, may kill the sweet corn plant because essentially, it is a warm season crop. Crop rating is 3 = good adaptability, and 4 = very good adaptability for a few varieties.

Eggplant

The eggplant is a warm season crop that thrives best at high temperatures. It is recommended for the summer time. Its rating is 5 = excellent adaptability.

Watermelon

The watermelon is a warm season crop. Due to leaf disease problems in humid areas, its number is 3 = good adaptability.

Tomato

Due to intensive research in Louisiana and Florida, tomato varieties have been developed for the tropics and sub-tropics. The crop is rated 5 = excellent adaptability. Rainfall or irrigation water will lower the temperature, thus preventing blossom drop of the tomato crop occurring at excessively high temperatures (above 98^{o}F).

Peppers

Bell peppers and hot peppers have very much the same climatic requirements as do the eggplant and the tomato. Some varieties may withstand lower temperatures than either the eggplant or the tomato. Its rating is 5 = excellent adaptability.

Sweet Potato

The entire plant of the sweet potato is easily injured by frost. Moderate rainfall is essential for crop adaptability. Its rating is 3 = good adaptability.

Cucumber

Since cucumbers, like mustard greens require only a short growing period to attain maturity, it can be grown at various latitudes. In addition, mustard and cucumbers are good forcing crops for greenhouse planting. Cucumber is rated 5 = excellent adaptability.

Snap Bean

The Snap Bean (*Phaseolus vulgaris*)and close relatives such as the Southern pea (*vigna sinensis*) are well adapted to average temperatures of Southeastern Louisiana. The leguminous plants are particularly useful in crop rotations. The rating for snap bean is 5 = excellent adaptability.

Squash

Squash and pumpkin were commonly used by the people of the Americas long before Columbus. Summer squash is of particular importance because, like cucumbers, they require only a short growing period. They succeed a little better in cooler climates than will watermelons. Its rating is 5 = excellent adaptability.

Okra

When the cool weather is over, successive plantings can be made successfully. Its rating is 5 = excellent adaptability.

Chayote (*Sechium edule*).

A perennial crop, the chayote produces abundantly during mild and high temperatures. Moderate freezing temperatures will kill the vines but not the roots if the plant is fully mature. Its rating is 5 = excellent adaptability.

CHAPTER V

HUMAN FACTORS ASSOCIATED WITH HORTICULTURAL CROP PRODUCTION

This chapter is dedicated to the analysis of human factors associated with horticultural crop production, the personal characteristics of the farmers, farmers' opinions, crops and varieties planted and vegetable practices and problems. The field data are presented and its significance described as follows:

Personal Characteristics of Farmers

The age of the respondents ranged from 32 to 80 years, and the mean age was 55.7 (See Table 2). It can be discerned from Table 2 that 74 percent of the respondents were older than 50, and 26 percent of them were within the age group of 30 to 49 years, indicating that the respondents were a relatively older group. The importance of this finding is: 1) that younger people in the Parish are not following the farming tradition of their parents; and 2) it is well known that old people are more resistant to cultural/technical change, compared with young people. On the other hand, however, the farmers in the parish had a fairly acceptable educational standard (See Table 3) where 66 percent of the respondents had completed the 8th grade through high school, and 10 percent had attended college, which would tend to minimize the resistance of the farmers to change because of age. Higher educational levels tend to make one more receptive to change.

Table 2

Age of the Respondents, Tangipahoa Parish, 1977-1978

Age Range	Participants	
	Frequency	Percent
30-39	4	8
40-49	9	18
50-59	17	34
Over 60	20	40
Total	50	100

Mean Age = 55.7

Table 3

Educational Status of the Respondents, Tangipahoa Parish 1977-1978

Educational Status	Respondents	
	Frequency	Percent
Attended College	5	10
8th Grade through High School	33	66
7th Grade and Below	12	24
Total	50	100

As expressed previously in the review of literature of this study, farm tenure is a very important factor when decisions are needed to solve farm problems. Owners generally are more responsive to innovations. Table 4 indicates that 94 percent of the respondents own their cultivated acreage and 6 percent are part owners and part renters of the land they farm. This farm tenure situation gives to most of these farmers (owners) a complete and permanent control over their farming operations.

Table 4

Farm Tenure of the Respondents, Tangipahoa Parish, 1977-1978

Farm Tenure	Respondents	
	Frequency	Percent
Owned	47	94
Part-Owned/Part Rented	3	6
Total	50	100

Table 5 presents data on the distribution of farmers' opinions as to the most important problems in producing vegetable crops. By far the most mentioned problem was labor, which accounts for 54 percent of the total. In addition, 18 percent mentioned weather conditions, 20 percent said pests, 6 percent indicated market prices and 2 percent (1 case) mentioned his advanced age. It was also reported by the respondents that as an average, 2.76 members of the family helped on their farms, and the range of numbers of hired labor was from 0 to 75 persons, with an average of 10.88.

Table 5

The Opinions of the Respondents as to the Most Important Problems in Producing Vegetable Crops, Tangipahoa Parish, 1977-1978

Problems	Respondents Frequency	Respondents Percent
Labor	27	54
Weather Conditions	9	18
Pests	10	20
Market Prices	3	6
Age	1	2
Total	50	100

The Crops and Varieties Planted

Table 6 presents data on the crops planted by the respondents. The data indicate that 46 percent of the respondents planted a combination of Strawberries, Bell Peppers and Cucumbers, 16 percent of them planted only Strawberries and Bell Peppers, and 4 percent planted Strawberries, Bell Peppers and Tomatoes. The rest of the respondents planted two, three or four crops in various mixtures.

Table 6

The Crops Planted by the Respondents on their Farms, Tangipahoa Parish, 1977-1978*

Crops	Respondents Frequency	Percent
Strawberries, bell peppers and cucumbers	23	46
Strawberries and bell peppers	8	16
Strawberries, bell peppers and tomato	2	4
Turnips and sweet potato	1	2
Strawberries, tomato and okra	1	2
Strawberries, mustard and shallots	1	2
Mustard and okra	1	2
Bell Peppers and cucumbers	1	2
Cabbage, turnip and mustard	1	2
Tomato, okra, and jalapenos	1	2
Strawberries, tomato, sweet potato, jalapenos	1	2
Cabbage, shallot, mustard, cauliflower	1	2
Bell pepper, cucumbers, and tomato	1	2
Strawberry, cabbage, sweet potato	1	2
Bell pepper, cucumber, snap bean	1	2
Strawberries, bell peppers, mustard	1	2
Bell pepper, cucumber, cabbage	1	2
Bell pepper, turnip, cucumber, squash	1	2
Cabbage, cauliflower, and Southern peas	1	2
Strawberries, cabbage, and sweet potato	1	2
Total	50	100

*See Figure 3)

Table 7 indicates the crop varieties farmers planted in 1977-1978. The majority of the varieties were the ones recommended for that area by the local Extension Service. Only a few Strawberry farmers, however, have planted Dabreak, an old strawberry variety developed and introduced in the early 60's.

A comparison of the crops planted by the farmers to the crops recommended by the model, indicates that Strawberries were rated four (very good adaptability) but not five. The labor problems involved in the Strawberry culture and the frequent loss of the first crop due to low temperature injury, however, are both risk factors. Due to the relatively high prices of the Strawberry market, however, food crop profitably makes the crop appealing as an agricultural enterprise. The majority of the other crops planted by farmers are rated number 5 in the model. Examples are: Tomatoes, Bell Peppers, Jalapenos, Snap Beans and Southern Peas. The latter two crops are not intensively planted in the area, however. Southern Peas and Snap Beans are highly recommended by virtue of high rating (See Table 1), and the important role legumes play in crop rotations such as soil improvement, sanitation and higher yields should be considered.

New crops to plant suggested by their classification in the model could be viable alternatives for the future. Such crops as Chinese Cabbage and Chayote, are new crops with a future. Chinese Cabbage is more tolerant to insect and disease problems than regular cabbage, and the Chayote produces abundantly. Market conditions, however, would have a direct influence as to whether they could be grown profitably.

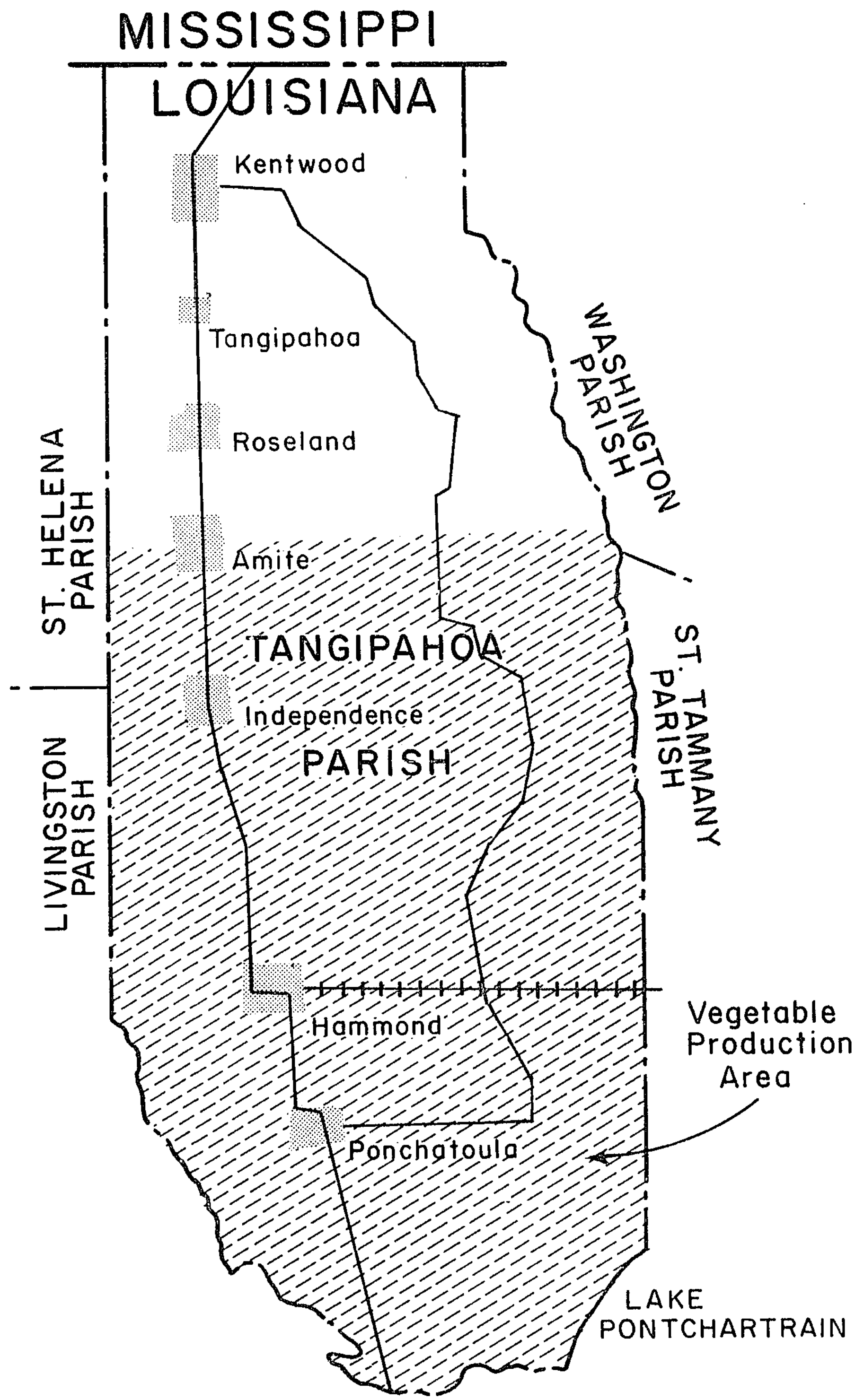

FIGURE 3. THE VEGETABLE PRODUCTION AREA TANGIPAHOA PARISH, 1977-78

Dabreak is still recommended, but ranked third by the Extension Service behind two newer varieties.

Table 7

Crop Varieties Planted by the Respondents, Tangipahoa Parish, 1977-1978

Variety	Crop	Frequency	Percent
Tangipahoa	Strawberry	37	74
Dabreak	Strawberry	2	4
Resistant Giant #3	Bell Pepper	24	48
Yolo Wonder	Bell Pepper	15	30
Pointsett	Cucumber	17	34
Ashley	Cucumber	11	22
Floralou	Tomato	3	6
Floradel	Tomato	3	6
Tropic	Tomato	1	2
Black Valentine	Bean	1	2
Harvester	Bean	3	6
Broad Leaf	Mustard	5	10
Clemson Spinless	Okra	2	4
La. Green Velvet	Okra	1	2
Jalapenos	Pepper	2	2
Centennial	Sw. Pot.	1	2
Puerto Rico	Sw. Pot	3	6
Purple Tops	Turnips	3	6
Unknown	Yellow Squash	1	2
Snow Ball	Cauliflower	1	2
Unknown	Cauliflower	1	2
Unknown	White Shallot	2	4

Selected Vegetable Production Practices

Table 8 presents a comparison between average cultivated acreage and the adoption of six selected farm practices. A statistically significant relationship (.24) existed at the 0.25 level of probability between the use of "hot beds" as an adopted practice and the mean cultivated acreage. Those who used the practice tended to have larger acreages of cultivated land.

The relationships between the other five practices and the mean cultivated acreage were not significant at the .25 level of probability. The practices involved were mulching, drainage, irrigation, plant protectors and resistant varieties.

Table 9 presents data on the relationship of practice adoption with educational level. Significant relationships did not exist when the six selected vegetable practices were compared with the number of respondents and their mean educational level. The same is true (See Table 10) when the same six selected vegetable practices were compared to the number of farmers and their respective mean age. These findings suggest that the particular dependent variables being tested, age and educational level, were not associated with the adoption of these specific practices in that particular environment.

Sources of Information

Tables 11 and 12 respectively indicate that when comparisons were made between radio listening as a source of weather informa-

Table 8

A Comparison With Selected Vegetable Production Practices By Number of Farmers and Average Cultivated Acreage by Practice Adoption

	YES		NO			
Practice	N	Mean Acreage	N	Mean Acreage	F[a]	P[b]
Mulching	42	9.42	7	6.42	0.56	0.45
Drainage	48	8.89	1	2.00	0.19	0.66
Irrigation	47	9.06	2	1.50	0.19	0.66
Plant Protectors	41	9.24	8	6.25	0.000	0.97
Resistant Varieties	48	8.87	1	3.00	0.47	0.49
Hot Beds	37	9.86	12	5.33	1.37	0.24

a) with 1 and 48 df

b) The level for determining statistical significance was set at 0.25.

Table 9

A Comparison With Selected Vegetable Production Practices by Number of Farmers and Mean Educational Levels by Practice Adoption

	YES		NO			
Practice	N	Mean Schooling	N	Mean Schooling	F[a]	p
Mulching	42	9.50	7	7.40	0.335	0.56
Drainage	48	9.29	1	6.00	0.175	0.67
Irrigation	47	9.36	2	6.00	-.454	0.50
Plant Protectors	41	9.46	8	8.00	0.062	0.80
Resistant Varieties	48	9.27	1	7.00	0.037	0.84
Hot Beds	37	9.48	12	8.41	0.343	0.56

a) With 1 and 48 df

Table 10

A Comparison With Selected Vegetable Production Practices by Number of Farmers and Mean Age by Practice Adoption

Practice	YES		NO			
	N	Mean Age	N	Mean Age	F[a]	p
Mulching	42	55.80	7	58.00	0.018	0.89 ns
Drainage	48	56.25	1	50.00	1.211	0.27 ns
Irrigation	47	55.89	2	61.50	0.999	0.32 ns
Plant Protectors	41	55.90	8	57.25	0.196	0.66 ns
Resistant Varieties	48	56.27	1	49.00	0.346	0.55 ns
Hot Beds	37	54.67	12	60.58	0.967	0.33 ns

a) With 1 and 48 df

Table 11

A Comparison of Mean Age to Radio Listening as a Source of Weather Information

	YES		NO			
Source	N	Mean Age	N	Mean Age	F[a]	P[b]
Radio Listening	16	52.00	33	58.12	1.81	0.18

a) With 1 and 48 df

b) The level for determining statistical significance was set at 0.25

Table 12

A Comparison of Mean Educational Level to Radio Listening as a Source of Weather Information

	YES		NO			
Source	N	Mean Schooling	N	Mean Schooling	F[a]	P[b]
Radio Listening	16	10.62	33	8.54	3.89	0.05

a) With 1 and 48 df

b) The level of statistical significance was set at 0.25

tion and mean age, and radio listening as a source of weather information and educational level, significant relationships were found to exist. The younger, more educated respondents were the ones who preferred radio listening as a source of weather information. A non-significant relationship was found between mean cultivated acreage and radio listening (See Table 13).

Tables 14 and 16 respectively present the comparisons between mean cultivated acreage and farmers' opinions on weather information reliability and mean age to farmers' opinions on weather information reliability. Neither mean cultivated acreage nor mean age showed a significant relationship to farmers' opinions on weather information reliability. However, when mean educational levels (Table 15) were compared to the respondents' opinions on weather service reliability, a significant relationship did exist. The more educated respondents gave cautious opinions on weather service reliability. "Fair" was the word they tended to use when they responded to the question on weather service reliability. The less educated tended to respond "reliable" and "highly reliable."

The Respondents' Willingness to Plant a New Crop

Table 17 indicates that a significant relationship did not exist when a comparison was made between number of farmers and mean cultivated acreage as to their willingness to plant a new

Table 13

A Comparison of Mean Cultivated Acreage to Radio Listening as a Source of Weather Information

Source	N	Mean Acreage	N	Mean Acreage	F^{a}	P
Radio Listening	16	7.06	33	9.57	0.91	0.34 ns

a) With 1 and 48 df

Table 14

A Comparison of Mean Cultivated Acreage to Farmers' Opinions Regarding Weather Information Reliability

Opinion	N	Mean Acreage
Reliable and Highly Reliable Combined	22	8.5
Fairly Reliable	27	9.0

F = 0.15 with 1 and 48 df

P 0.85 ns

Table 15

A Comparison of Mean Educational Level to Farmers' Opinions Regarding Weather Information Reliability

Opinion	N	Mean Schooling
Reliable and Highly Reliable Combined	22	8.5
Fairly Reliable	27	10.0

F = 1.83 with 2 and 48 df

P 0.17

Table 16

A Comparison of Mean Age to Farmers' Opinions Regarding Weather Information Reliability

Opinion	N	Mean Age
Reliable and Highly Reliable Combined	22	57.00
Fairly Reliable	27	55.74

F = 0.43 with 2 and 48 df

P 0.65 ns

Table 17

A Comparison Between Number of Farmers and Mean Cultivated Acreage to Their Willingness to Plant A New Crop

	YES		NO				
Attitude	N	Mean Acreage	N	Mean Acreage	F	df	P
Willingness to Plant a New Crop	25	9.52	24	7.95	0.305	1 and 48	0.58 ns

crop. The same is true (See Table 19) when the mean age of respondents was compared with the respondents' willingness to plant a new crop. However, when mean educational level of respondents was compared to the respondents' willingness to plant a new crop, a significant relationship was found to exist (See Table 18). It seems logical that the respondents with more education would show more willingness to plant a new crop and this finding supports this assumption.

Correlation Between Variables

For the purpose of this dissertation, r from .00 to ± .20 denotes indifferent relationship; r from ± .20 to ± .40 denotes low correlation; r from ± .40 to ± .70 denotes substantial relationship; and r from ± .70 to ± 1.00 denotes high relationship. Table 20 indicates various degrees of relationships between years of farming, cultivated acreage, education and age. A substantial negative correlation (r = -.65) was found between acreage and age: As farmers get older the less acreage they cultivate. In addition, when years of farming were correlated to cultivated acreage (r = .95), a high positive correlation was found which seems contradictory to the negative relationship between age and acreage planted. One interpretation is that as young farmers gain more farming experience, they increase their cultivated acreage until they reach a peak at a certain age, then they tend to plant less

Table 18

A Comparison Between Number of Farmers and Mean Educational Level to Their Willingness to Plant a New Crop

	YES		NO				
Attitude	N	Mean Schooling	N	Mean Schooling	F	df	P
Willingness to Plant a New Crop	25	10.28	24	8.12	2.21	1 and 48	0.14

Table 19

A Comparison Between Number of Farmers and Mean Age to Farmers' Willingness to Plant a a New Crop

	YES		NO				
Attitude	N	Mean Age	N	Mean Age	F	df	P
Willingness to Plant a New Crop	25	53.48	24	58.87	0.49	1 and 48	0.48 ns

Table 20

Relationships Between Years of Farming, Cultivated Acreage, Education, and Age of Vegetable Farmers

Covariables	N	r Values	P
Years Farming: Cultivated Acreage	50	.0079	0.95
Years Farming: Education	50	-.41	0.002
Years Farming: Age	50	0.75	0.0001
Cultivated Acreage: Education	50	0.176	0.219
Cultivated Acreage: Age	50	-.065	0.65
Education: Age	50	-.60	0.0001

acreage as they reduce physical activity for reasons such as farming aspirations having been fulfilled, less need for money, and health problems.

CHAPTER VI

SUMMARY AND CONCLUSIONS

Summary

This dissertation, as suggested by its title, deals not only with climatic factors and crop requirements and characteristics but also with the human influences affecting the selection of horticultural crops for vegetable farming.

As stated in the objectives, this work had as its purpose the following:

1. Developing a model for evaluating horticultural crops for suitability to a particular location.
2. Testing the model under Southeast Louisiana conditions by screening through the model selected horticultural crops. The elements for the construction of the model consisted of regional-historical weather data, vegetable crop characteristics and the climatic requirements of the horticultural crops involved.
3. Establishing associations between the personal characteristics of the farmers and farmers' attitudes and opinions.

The methodology for this study consisted of collecting weather data from the U.S. Weather Bureau, analyzing research reports on horticultural crops and the use of an interview schedule in collecting the data from the fifty vegetable growers of the Tangipahoa Parish.

In testing the model, a total of 24 horticultural crops were screened as follows: twelve crops were rated 5 = excellent adaptability, two crops: 4 = very good adaptability, eight crops: 3 = good adaptability, one crop: 2 = fair adaptability, and one crop: 0 = not adaptable. The model presented was found useful to test all possible horticultural crops by screening them through the model. The result was a list of traditional and non-traditional crops recommended for the prevailing conditions of Southern Louisiana. Thus, the model was useful in reducing the number of future field experiments.

Some associations between personal characteristics of farmers and farmers' attitudes and farming practices were found to be statistically significant at the 0.25 level of probability. A statistically significant negative correlation was found between cultivated acreage and age and a positive correlation was found to exist between years of farming and cultivated acreage. One interpretation is that as young farmers gain more farming experience, they increased their cultivated acreage until they reached a peak at a certain age, then they tended to plant less acreage as they reduced physical activity for reasons such as farming aspirations being fulfilled and health problems.

The relationship between average cultivated acreage and the farm practice "hot beds" was found to be statistically significant. Those farmers who used the practice, tended to have larger acreages of cultivated land. The relationships between the other five practices and the average cultivated acreage were found to be not significant at the .25 level of probability. In addition, significant relationships did not exist when the six selected vegetable practices (mulching, drainage, irrigation, plant protectors, resistant varieties and hot beds) were compared to the number of respondents and their mean educational level. The same is true when the same six practices were compared to the number of farmers and their respective mean age.

Conclusions

The model for screening horticultural crops for adaptability was construed by means of utilizing historical weather data for the region, along with the climatic requirements and characteristics of horticultural crops. The model proved to be workable and useful in selecting horticultural crops for Southeast Louisiana. It must be remembered, however, that some horticultural crops, notwithstanding a low rating when they are screened through the model, may well thrive sometime in the future in the same area if the proper selection of varieties is made for adaptability. To cite an example, currently there is a problem with the Centennial variety of sweet potatoes; it does not perform well under very humid conditions. Research activity at Louisiana State University is aimed at Sweet Potato adaptability to withstand more humid soil conditions. There will always be a need for further research for crop tolerance to unfavorable climatic conditions. As an example, for the crops rated in this work from 0 to 3, improvements in adaptability could be gained by varietal selection trials or by breeding for pre-selected characteristics.

The findings in relation to safe planting and harvesting dates of selected horticultural crops indicate, that frost-free conditions can be expected from week 14 (April) to week 43 (October) and that precipitation would generally be fairly well distributed over the typical year. This is emphasized by the work of Went and Cooper (23) that temperature and rainfall are the most important climatic factors influencing horticultural production. The use of the model, for example, suggested several new crops for Tangipahoa Parish, such as, Chinese Cabbage and Chayote and indicated several must be remembered however, that some horticultural crops, even notwithstanding a low rating when they are screened through the model, may well thrive sometime in the future in the same area if the proper selection of varieties is made for adaptability. To cite an example, currently there is a problem with the Centennial variety of sweet potatoes; it does not perform well under very humid conditions. Research activity at Louisiana State University is aimed at Sweet Potato adaptability to withstand more humid soil conditions. There will be always a need for further research for crop tolerance to unfavorable climatic conditions. As an example, for the crops rated in this work from 0 to 3, improvements in adaptability could be gained by varietal selection trials or by breeding for pre-selected characteristics.

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The findings in relation to the human factors, when compared with the generalizations present in the literature, indicate that problems in the use of the model could be expected. The average age of the farmers in the study was 55.7 years. The adoption literature suggests that age is negatively associated with adoption behavior. It is further suggested in the literature that more complex practices are more difficult to innovate. As suggested in the model, change from one variety to another may not be too difficult, but the introduction of entirely new crops might be more difficult. Combined with the problem of the older audience, the problem could be compounded.

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APPENDICES

APPENDIX A

INTERVIEW SCHEDULE

Good morning, I am Salvador Quiroz; may I come in and visit with you for a few minutes?

> You are one of a few persons selected to give kind cooperation in this study to know more about the climate of this area of Louisiana and its influence on certain vegetable crops.

1. Mr. ______________________________, how long have you been in this area.

2. Which crops and varieties did you plant this year?

Strawberries	Turnips	Sweet Potatoes
Bell Peppers	Shallots	Hot Peppers
Cucumbers	Greens	Okra
Green Snap Beans	Cabbage	Southern Peas
Tomatoes	Cauliflower	Others ____________
	Parsley	____________
Others ___________	Others ___________	
	___________	

3. Are there other crops which you feel you can grow?

4. Which crops do you plan to plant next year?

5. If new crops.............Why?

6. When do you plant ....and harvest?

Crop	Plant: Dates	Plant: Why	Harvest: Dates	Harvest: Why

7. When do other farmers plant ....and harvest these crops?

Crop	Dates	Why	Dates	Why
Strawberries				
Bell Peppers				
Cucumbers				
Green Snap Beans				
Tomatoes				
Turnips				
Shallots				
Greens				
Cabbage				
Cauliflower				
Sweet Potato				
Others				

8. Do you use the following practices?

Practices	Yes	No	Have Used in the Past	Why?
a) Early Planting				
b) Late Planting				
c) Mulching				
d) Drainage				
e) Irrigation				
f) Plant Protectors				
g) Resistant Varieties				
h) Greenhouse Facilities, (e.g., hot beds, cold frames)				

9. What is the size of this farm?____________________

10. Do you own or rent this farm?____________________

11. What was the last grade you had an opportunity to complete?

____

12. What is your age?__________Years

13. Which vegetables would you like to grow but feel you can't grow successfully due to weather conditions?

Crop: What Conditions:

14. Where do you get your weather information?

TV channels

Radio

Newspapers

Almanac

Journals

Others

15. How reliable do you think the weather service is?

a) Very reliable____________________

b) Reliable________________________

c) Fairly Reliable__________________

d) Unreliable_______________________

16. When do you expect frost dangerous to your crops?

17. What are your major problems in producing vegetables?

18. How many members of your family help you on your farm?

19. How many hired laborers help you on your farm?

Thank you very much. I appreciate your help; have a good day.

APPENDIX B

Table 1. Maximum and Minimum Temperatures by Day and by Week
Baton Rouge, Louisiana, 1948-1973

Variable	Period	Days	Max.	Min.	Wk N	Max/wk	Min/wk
Temp.	1948-1973	Jan 1	82.0	22.0			
		2	80.0	25.0	1	82	20
		3	77.0	30.0			
		4	77.0	24.0			
		5	77.0	21.0			
		6	77.0	26.0			
		7	79.0	20.0			
		8	79.0	20.0			
		9	80.0	21.0	2	87	10
		10	78.0	12.0			
		11	77.0	10.0			
		12	80.0	11.0			
		13	87.0	15.0			
		14	77.0	20.0			
		15	77.0	22.0			
		16	79.0	22.0			
		17	77.0	20.0			
		18	78.0	16.0			

Table 1 Continued

Table 1 (Continued)

Variable	Period	Days	Max.	Min.	Wk N	Max/wk	Min/wk
Temp.	1948-1973	Jan 19	78.0	26.0			
		20	80.0	23.0			
		21	79.0	25.0			
		22	79.0	22.0			
		23	80.0	19.0	4	82	12
		24	79.0	12.0			
		25	80.0	17.0			
		26	80.0	27.0			
		27	80.0	24.0			
		28	82.0	25.0			
		29	80.0	20.0			
		30	80.0	15.0	5	85	13
		Feb 1	79.0	18.0			
		2	81.0	13.0			
		3	81.0	13.0			
		4	85.0	21.0			
		5	82.0	25.0			
		6	81.0	31.0	6	83	23
		7	82.0	26.0			
		8	83.0	24.0			
		9	82.0	24.0			
		10	83.0	23.0			
		11	79.0	24.0			

Table 1 Continued

Table 1 (Continued)

Variable	Period	Days	Max.	Min.	Wk N	Max/wk	Min/wk
Temp.	1948-1973	Feb 12	80.0	24.0			
		13	81.0	20.0	7	81	20
		14	81.0	22.0			
		15	80.0	31.0			
		16	80.0	29.0			
		17	77.0	29.0			
		18	79.0	24.0			
		19	80.0	26.0			
		20	78.0	30.0	8	84	25
		21	82.0	30.0			
		22	79.0	28.0			
		23	81.0	25.0			
		24	79.0	25.0			
		25	84.0	25.0			
		26	83.0	26.0			
		27	85.0	31.0	9	85	26
		28	81.0	36.0			
		29	80.0	31.0			
		Mar 1	82.0	27.0			
		2	84.0	36.0			
		3	83.0	30.0			
		4	85.0	26.0			
		5	85.0	31.0			

Table 1 Continued

Table 1 (Continued)

Variable	Period	Days		Max.	Min.	Wk N	Max/wk	Min/wk
Temp	1948-1973	Mar	6	83.0	28.0	10	86	28
			7	83.0	31.0			
			8	84.0	30.0			
			9	81.0	33.0			
			10	82.0	30.0			
			11	85.0	32.0			
			12	86.0	31.0			
			13	89.0	30.0	11	91	30
			14	86.0	32.0			
			15	87.0	34.0			
			17	91.0	34.0			
			18	89.0	36.0			
			19	85.0	32.0			
			20	83.0	27.0	12	85	27
			21	83.0	28.0			
			22	80.0	33.0			
			23	82.0	33.0			
			24	84.0	31.0			
			25	85.0	33.0			
			26	84.0	32.0			
			27	83.0	28.0	13	87	28
			28	86.0	38.0			
			30	85.0	38.0			

Table 1 Continued

Table 1 (Continued)

Variable	Period	Days		Max.	Min.	Wk N	Max/wk	Min/wk
Temp.	1948-1973	Mar	31	87.0	37.0			
		Apr	1	85.0	39.0			
			2	86.0	38.0			
			3	86.0	37.0	14	89	37
			4	86.0	41.0			
			5	87.0	41.0			
			6	86.0	39.0			
			7	89.0	37.0			
			8	86.0	37.0			
			9	87.0	40.0			
			10	88.0	40.0	15	90	37
			11	90.0	37.0			
			12	86.0	42.0			
			13	88.0	40.0			
			14	89.0	39.0			
			15	89.0	38.0			
			16	87.0	40.0			
			17	87.0	41.0	16	90	41
			18	88.0	45.0			
			19	87.0	42.0			
			20	89.0	40.0			
			21	90.0	41.0			
			22	90.0	48.0			

Table 1 Continued

Table 1 (Continued)

Variable	Period	Days		Max.	Min.	Wk N	Max/wk	Min/wk
Temp	1948-1973	Apr	23	90.0	45.0			
			24	91.0	46.0	17	92	46
			25	89.0	46.0			
			26	89.0	50.0			
			27	90.0	48.0			
			28	90.0	50.0			
			29	91.0	47.0			
			30	92.0	46.0			
		May	1	89.0	50.0	18	95	44
			2	89.0	52.0			
			3	90.0	48.0			
			4	94.0	44.0			
			5	95.0	45.0			
			6	94.0	49.0			
			7	92.0	49.0			
			8	90.0	52.0	19	92	46
			9	90.0	53.0			
			10	90.0	48.0			
			11	90.0	50.0			
			12	91.0	47.0			
			13	92.0	46.0			
			14	90.0	51.0			
			15	94.0	51.0	20	96	50

Table 1 Continued

Table 1 (Continued)

Variable	Period	Days		Max.	Min.	Wk N	Max/wk	Min/wk
Temp	1948-1973	May	16	94.0	51.0			
			17	93.0	53.0			
			18	95.0	59.0			
			19	96.0	60.0			
			20	93.0	57.0			
			21	91.0	50.0			
			22	93.0	51.0	21	98	47
			23	92.0	54.0			
			24	92.0	55.0			
			25	93.0	59.0			
			26	95.0	56.0			
			27	96.0	49.0			
			28	98.0	47.0			
			29	94.0	51.0	22	96	51
			30	94.0	58.0			
			31	95.0	59.0			
		June	1	95.0	55.0			
			2	96.0	55.0			
			3	96.0	55.0			
			4	96.0	60.0			
			5	97.0	55.0	23	99	55
			6	99.0	62.0			
			7	99.0	62.0			

Table 1 Continued

Table 1 (Continued)

Variable	Period	Days		Max.	Min.	Wk N	Max/wk	Min/wk
Temp	1948-1973	June	8	98.0	62.0			
			9	98.0	64.0			
			10	99.0	63.0			
			11	98.0	59.0			
			12	99.0	58.0	24	100	58
			13	98.0	62.0			
			14	100.0	67.0			
			15	100.0	65.0			
			16	96.0	62.0			
			17	95.0	62.0			
			18	96.0	62.0			
			19	97.0	63.0	25	100	61
			20	97.0	61.0			
			21	100.0	63.0			
			22	98.0	64.0			
			23	98.0	68.0			
			24	97.0	67.0			
			25	97.0	66.0			
			26	98.0	66.0	26	100	61
			27	99.0	61.0			
			28	100.0	60.0			
			29	99.0	63.0			
			30	103.0	66.0			

Table 1 Continued

Table 1 (Continued)

Variable	Period	Days		Max.	Min.	Wk N	Max/wk	Min/wk
Temp.	1948-1973	July	1	99.0	65.0			
			2	99.0	68.0			
			3	99.0	69.0	27	99	65
			4	99.0	68.0			
			5	99.0	65.0			
			6	99.0	66.0			
			7	98.0	66.0			
			8	99.0	67.0			
			9	99.0	69.0			
			10	99.0	68.0	28	101	58
			11	97.0	68.0			
			12	101.0	67.0			
			13	99.0	68.0			
			14	97.0	64.0			
			15	96.0	58.0			
			16	97.0	59.0			
			17	98.0	64.0	29	99	64
			18	98.0	65.0			
			19	97.0	70.0			
			20	99.0	68.0			
			21	96.0	68.0			
			22	97.0	66.0			
			23	95.0	67.0			

Table 1 Continued

Table 1 (Continued)

Variable	Period	Days		Max.	Min.	Wk N	Max/wk	Min/wk
Temp	1948-1973	July	24	98.0	68.0	30	98	68
			25	97.0	70.0			
			26	98.0	71.0			
			27	98.0	70.0			
			28	98.0	68.0			
			29	98.0	68.0			
			30	96.0	69.0			
			31	96.0	67.0	31	100	66
		Aug	1	95.0	69.0			
			2	95.0	68.0			
			3	94.0	67.0			
			4	100.0	68.0			
			5	100.0	67.0			
			6	100.0	66.0			
			7	98.0	66.0	32	102	59
			8	100.0	66.0			
			9	102.0	70.0			
			10	102.0	67.0			
			11	101.0	66.0			
			12	99.0	59.0			
			13	102.0	66.0			
			14	100.0	66.0	33	100	64
			15	98.0	65.0			

Table 1 Continued

Table 1 (Continued)

Variable	Period	Days		Max.	Min.	Wk N	Max/wk	Min/wk
Temp.	1948-1973	Aug	16	97.0	64.0			
			17	98.0	66.0			
			18	98.0	66.0			
			19	98.0	66.0			
			20	98.0	66.0			
			21	97.0	64.0	34	97	60
			22	97.0	61.0			
			23	96.0	60.0			
			24	87.0	64.0			
			25	97.0	64.0			
			26	96.0	62.0			
			27	97.0	64.0			
			28	97.0	61.0	35	102	60
			29	96.0	66.0			
			30	102.0	60.0			
			31	99.0	64.0			
		Sept	1	96.0	63.0			
			2	99.0	60.0			
			3	98.0	60.0			
			4	95.0	58.0	36	97	57
			5	95.0	60.0			
			6	95.0	60.0			
			7	97.0	59.0			

Table 1 Continued

Table 1 (Continued)

Variable	Period	Days		Max.	Min.	Wk N	Max/wk	Min/wk
Temp	1948-1973	Sept	8	95.0	61.0			
			9	96.0	63.0			
			10	97.0	60.0			
			11	95.0	58.0	37	96	55
			12	95.0	56.0			
			13	95.0	58.0			
			14	95.0	56.0			
			15	96.0	57.0			
			16	94.0	55.0			
			17	95.0	55.0			
			18	95.0	55.0	38	96	55
			19	96.0	55.0			
			20	96.0	60.0			
			21	94.0	56.0			
			22	94.0	57.0			
			23	93.0	55.0			
			24	93.0	57.0			
			25	92.0	54.0	39	97	43
			26	93.0	57.0			
			27	93.0	54.0			
			28	97.0	47.0			
			29	95.0	43.0			
			30	93.0	44.0			

Table 1 Continued

Table 1 (Continued)

Variable	Period	Days		Max.	Min.	Wk N	Max/wk	Min/wk
Temp	1948-1973	Oct	1	92.0	47.0			
			2	94.0	49.0	40	94	40
			3	92.0	50.0			
			4	93.0	46.0			
			5	91.0	47.0			
			6	93.0	44.0			
			7	92.0	43.0			
			8	92.0	40.0			
			9	93.0	44.0	41	93	41
			10	92.0	42.0			
			11	90.0	41.0			
			12	92.0	42.0			
			13	92.0	46.0			
			14	91.0	45.0			
			15	92.0	43.0			
			16	90.0	44.0	42	91	36
			17	91.0	44.0			
			18	91.0	46.0			
			19	87.0	36.0			
			20	87.0	39.0			
			21	86.0	39.0			
			22	88.0	40.0			
			23	88.0	40.0	43	89	32

Table 1 Continued

Table 1 (Continued)

Variable	Period	Days		Max.	Min.	Wk N	Max/wk	Min/wk
Temp	1948-1973	Oct	24	85.0	43.0			
			25	84.0	38.0			
			26	87.0	37.0			
			27	88.0	35.0			
			28	89.0	32.0			
			29	86.0	33.0			
			30	87.0	32.0	44	87	28
			31	87.0	35.0			
		Nov	1	86.0	37.0			
			2	85.0	32.0			
			3	84.0	28.0			
			4	84.0	32.0			
			5	85.0	32.0			
			6	85.0	33.0	45	85	28
			7	84.0	28.0			
			8	83.0	29.0			
			9	84.0	29.0			
			10	80.0	30.0			
			11	84.0	32.0			
			12	85.0	30.0			
			13	85.0	29.0	46	85	25
			14	85.0	33.0			
			15	84.0	29.0			

Table 1 Continued

Table 1 (Continued)

Variable	Period	Days		Max.	Min.	Wk N	Max/wk	Min/wk
Temp	1948-1973	Nov	16	85.0	34.0			
			17	83.0	29.0			
			18	83.0	25.0			
			19	82.0	28.0			
			20	84.0	29.0	47	85	24
			21	80.0	30.0			
			22	83.0	29.0			
			23	85.0	28.0			
			24	85.0	24.0			
			25	83.0	25.0			
			26	85.0	30.0			
			27	83.0	26.0	48	83	22
			28	81.0	28.0			
			29	81.0	27.0			
			30	77.0	25.0			
		Dec	1	80.0	26.0			
			2	77.0	22.0			
			3	81.0	26.0			
			4	78.0	30.0	49	83	20
			5	80.0	33.0			
			5	81.0	26.0			
			7	82.0	20.0			
			8	82.0	27.0			

Table 1 Continued

Table 1 (Continued)

Variable	Period	Days		Max.	Min.	Wk N	Max/wk	Min/wk
Temp	1948-1973	Dec	9	83.0	28.0			
			10	78.0	28.0			
			11	81.0	24.0	50	83	11
			12	83.0	15.0			
			13	78.0	11.0			
			14	81.0	24.0			
			15	80.0	24.0			
			16	82.0	21.0			
			17	77.0	22.0			
			18	75.0	28.0	51	75	19
			19	77.0	26.0			
			20	81.0	28.0			
			21	81.0	26.0			
			22	80.0	22.0			
			23	79.0	23.0			
			24	80.0	19.0			
			25	79.0	24.0	52	81	23
			26	76.0	28.0			
			27	77.0	27.0			
			28	75.0	27.0			
			29	79.0	23.0			
			30	81.0	29.0			
			31	79.0	27.0			

APPENDIX C

Table Maximum and Minimum Precipitation Rates by Weeks, Baton Rouge, Louisiana, 1948-1973

Variable	Period	Month	Week #	Wk Max	Wk Min	Sum Daily Means
Rainfall	1948-1973	Jan 1-08	1	2.65	0.96	1.15
		9-15	2	2.01	1.08	0.64
		16-22	3	1.71	0.77	0.84
		23-29	4	1.49	0.98	0.82
		J/F30-05	5	3.40	1.09	1.05
		Feb 6-12	6	3.65	0.44	1.12
		13-19	7	4.51	1.34	1.51
		20-26	8	2.11	.054	1.18
		F/M27-05	9	3.69	0.57	1.57
		Mar 6-12	10	2.56	0.37	0.57
		13-19	11	2.36	0.27	0.89
		20-26	12	5.25	0.56	1.13
		M/A27-02	13	2.15	0.71	0.86
		Apr 3-09	14	2.84	0.21	1.15
		10-16	15	11.99	1.10	1.73
		17-23	16	2.96	0.20	0.77
		24-30	17	4.10	0.45	1.19
		May 1-07	18	4.85	1.65	1.63
		8-14	19	3.51	0.32	0.73

Cont'd.

Table (Continued)

Variable	Period	Month	Week#	Wk Max	Wk Min	Sum Daily Means
Rainfall	1948-1973	May 15-21	20	4.83	0.22	0.87
		22-28	21	1.50	0.39	0.83
		M/J 29-04	22	1.76	0.15	0.62
		June 5-11	23	3.00	0.50	0.77
		12-18	24	1.77	0.64	0.72
		19-25	25	3.20	0.57	0.77
		J/J 26-02	26	2.72	1.05	1.27
		July 3-9	27	2.31	0.44	0.78
		10-16	28	4.26	1.60	2.07
		17-23	29	2.33	1.21	1.58
		24-30	30	2.72	1.14	1.54
		J/A 31-06	31	2.62	0.42	1.11
		Aug 7-13	32	2.78	0.47	1.00
		14-20	33	1.69	0.93	1.03
		21-27	34	3.28	0.64	1.03
		21-27	34	3.28	0.64	1.23
		A/S 28-03	35	1.27	0.51	0.54
		Sept 4-10	36	3.99	0.35	1.17
		11-17	37	6.31	0.92	1.32
		18-24	38	2.23	0.14	0.50
		S/O 25-01	39	3.60	0.32	0.87
		Oct 2-08	40	4.84	0.60	0.98
		9-15	41	1.99	0.35	0.49

Cont'd.

Table (Continued)

Variable	Period	Month	Week #	Wk Max	Wk Min	Sum Daily Means
Rainfall	1948-1973	Oct 16-22	42	1.84	0.49	0.49
		23-29	43	2.10	0.07	0.32
		O/N 30-05	44	2.82	0.37	0.95
		Nov 6-12	45	1.44	0.64	0.55
		13-19	46	4.20	0.10	0.96
		20-26	47	5.04	0.27	0.92
		N/D 27-03	48	3.43	1 05	0.95
		Dec 4-10	49	3.97	0.63	1.40
		11-17	50	2.81	0.94	1.39
		18-24	51	3.35	0.55	1.24
		25-31	52	5.04	0.54	1.10

VITA

Salvador Quiroz was born on March 12, 1936, in Cofradia, Cortez, Honduras. Following graduation from Comayagua School for Teachers in 1952, he attended the Panamerican Agricultural School, Zamorano, Honduras. After obtaining the degree of Agronomist in 1958, he was employed as a County Extension Agent for the Honduran Ministry of Natural Resources. After working for three years, he enrolled in the graduate school of Economics and Social Sciences in Turrialba, Costa Rica. After obtaining all the credits for the M. A. degree, he enrolled in the University of Florida, Gainesville, where he obtained the degree of B.S.A. and M.S. in plant sciences. In 1976 he enrolled in the graduate school of Louisiana State University where he became a candidate for the degree of Doctor of Education.

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EXAMINATION AND THESIS REPORT

Candidate: Salvador Quiroz

Major Field: Extension Education

Title of Thesis: "Climatic and Human Factors Associated with the Production of Selected Vegetable Crops in an Area of Louisiana"

Approved:

J. Pesson

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Date of Examination:

July 20, 1978